Ioffe Institute
6th Int. Symp. "Nanostructures: Physics and Technology"
St Petersburg, Russia, June 22–26, 1998.

InP based materials for long wavelength optoelectronics grown in multiwafer planetary reactors

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Multiwafer MOVPE growth is a well established technique for the mass production of III–V compounds. Especially GaAs based materials like AlGaAs, GaInP and AlGaInP are grown in multiwafer Planetary Reactors®. These reactors allow the simultaneous growth of 7, 15, 35 or $95\times2''$ wafers. As shown in earlier publications, the Planetary Reactors® combine a very high growth efficiency with extreme uniformities in thickness and composition. However, there is also a growing demand for InP based materials to be grown in multiwafer reactors in order to increase the throughput in the production of long wavelength optoelectronics devices.

In this paper we want to present data on the growth of InP based materials ($Ga_xIn_{1-x}As_yP_{1-y}$) in a Planetary Reactor®. The reactor that has been used is an AIX 2400 system allowing the growth of $15\times2''$ wafers or $8\times3''$ wafers. As a demonstration material GaInAsP with an emisssion wavelength of approx. 1.5 μm was choosen.

The results show that the excellent uniformity that is well-known for GaAs based materials is also found for GaInAsP on InP. Without any optimization, wavelegth uniformities as low as 1 nm were obtained. Thickness uniformities of 2% were measured. Furthermore, doped samples were grown. As dopants silane and dimethylzinc were used. Sheet resistivity measurements performed on these samples reveal uniformities around 1%.

The results demonstrate that Planetary Reactors® are an efficient tool for the mass production of GaInAsP alloys lattice matched to InP. The uniformity data show that the unique Planetary double rotation principle allows the growth of homogenous GaInAsP without any tuning of flow rates or gas velocities. Since the GaInAsP composition is very sensitive towards changes of the growth temperature, a very uniform wafer temperature is indicated. This is also confirmed by the excellent doping uniformity. As a conclusion, we find that Planetary Reactors® are the ideal tool for an efficient mass production of InP based compounds.